

IMPERFECT MARKET STRUCTURE
AND
INTERNATIONAL TRADE

by

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A REPORT

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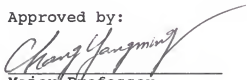
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As author, I am solely responsible for any shortcoming or errors in this report.

I. INTRODUCTION

1. Standard Trade Theory

The standard theory of international trade¹ has for a long time relied on the assumptions and the model of perfect competition. International economists call for free trade which is part of the general theory for free markets. Free market analyses depend on the market system where scarce resources are allocated via prices generated from supply and demand.

In the case of international trade, economists argue that free trade exploits each country's comparative advantage and leads to an efficient allocation of resources. Free trade leads to specialization in production according to availability of resources and costs of production. For example, a country like the United States would specialize in producing capital-intensive goods while a country like Bangladesh would specialize in producing labor-intensive goods, and England would be involved in industries that depend on using coal

¹See J. Bhagwati, 1964, "The Pure Theory of International Trade: A survey", The Economic Journal 74, (March), p. 4.

See also J. S. Chipman, 1965, "A Survey of Theory of International Trade: Part 1, The Classical Theory." Econometrica 33, (July), p. 477.

See also J. S. Chipman, 1965, "A Survey of the Theory of International Trade: Part 2, The Neo-Classical Theory," Econometrica 33, (October), p. 685.

resources, and so on. This specialization would lead to greater overall production. These countries would then trade freely so that consumers can obtain the products they would like to consume.

International economists have long opposed trade restrictions imposed by governments. They argue that they distort the allocation of resources to less efficient uses and distorts prices.

2. New Developments in Trade Theory

Recently, it has been recognized that a significant proportion of international trade takes place between countries with similar production/consumption characteristics. It has been pointed out by some economists that some characteristics of international trade forces it to deviate from the standard trade theory and perfect competition. Krugman (1983) suggests that much of the world's trade in manufacturing occurs between industrial countries with similar relative factor endowments, and involves two-way exchanges of goods produced with similar factor proportions². The perfectly competitive model is inappropriate when there are large start-up or overhead costs, learning-by-doing, and research and development, as has been noted by Brander (1986). Also, it

²Paul R. Krugman, 1983, "New Theories of Trade Among Industrial Countries," American Economic Review, AEA Papers and Proceedings, (May), p. 343.

fails to address the issues raised by firms and policymakers.³ Avinash Dixit (1984) points out that some industries involved in international trade might face increasing economies of scale rather than constant costs, as assumed in the model of perfect competition, and become oligopolistic as these industries come to consist of few and large multi-national firms. The model of perfect competition is less able to incorporate entry barriers created by technological features or by government's actions. Dixit also points out that product differentiation is another factor that reduces the size of the competing market and increases the market power of firms. Finally, this deviation from the standard trade theory might be due to marketing and trade when these activities are carried out by a few trading corporations.⁴

Because of these factors the standard trade theory seems incapable of answering many of today's questions about international trade. Thus, alternative models to explain the nature of trade have been hypothesized. These alternative models adopt ideas from other fields of economics.

Looking at the factors discussed above, there is so much integration between international trade and industrial

³James A. Brander, 1986, "Rationales for Strategic Trade and Industrial Policy," in: Paul R. Krugman, ed., Strategic Trade Policy and the New International Economics, the MIT Press, Cambridge, Massachusetts, p. 25.

⁴Avinash K. Dixit, 1984, "International Trade Policy for Oligopolistic Industries," Economic Journal, Conference Papers 94, pp. 1-2.

organization since international trade has the characteristics of an oligopolistic market structure. Thus, economists have begun to analyze international trade using theories of imperfect competition developed by industrial organization economists.

It makes sense to analyze trade policy using models that are at least capable of describing most of today's trade actions noting that the volume of trade between two countries is larger the closer their economies are to being on the same level. Also, the two-way trade between these two countries involves goods that have similar production processes and produce goods with similar factor proportions. As Dixit has pointed out:

The combination of international trade and industrial organization produces several features of analysis that are novel to the workers in the separate areas. For international economists, there are new aspects of competition, such as quality, advertising, research and development, new dimensions of firm's behavior including strategic moves such as threats and promises, and new equilibrium concepts appropriate to imperfectly competitive markets, for example Cournot. For industrial economists, there are new reasons for inter-firm cost differences, namely international differences of factor prices, transport costs, taxes, and tariffs.⁵

In response to this matter, in the past few years many economists and theorists (for example, Basevi, Brander and Spencer, Dixit, Eaton and Grossman, Krugman, and others) have

⁵Avinash K. Dixit, 1984, "International Trade Policy for Oligopolistic Industries," p. 3.

begun analyzing international trade using new models to replace the standard trade theory. They have focused on rent shifting, increasing the domestic welfare, and protecting domestic industry using export subsidies, export taxes, R&D subsidies, tariffs and so on. These new models often rely on restrictive assumptions which are probably inevitable given the inherent complexity of the world.

In this report I will attempt to follow the steps of Krugman in sketching out two concepts which recently have been recognized as a means to explain international trade. The first is the concept of "intraindustry" trade, where scale economies as well as comparative advantage are a major cause of trade and gains from trade. The second is the concept of technological competition, which emphasizes international competition in research-intensive industries.⁶

3. Organization of the Report

This report is organized as follows. The next section contains a discussion of the theory of intra-industry trade. The theory of technological competition and its policy implications are discussed in section III. Section IV focuses on the reaction of foreign governments in response to home government policies and the interaction between governments. Finally, Section V contains some policy implications and concluding remarks.

⁶Paul R. Krugman, 1983, "New Theories of Trade Among Industrial Countries," p. 343.

II. INTRA-INDUSTRY TRADE THEORY:

Traditional trade theory is less able to describe trade. An important alternative theory is the theory of intra-industry trade. This theory does not depend only on the comparative advantage, but on the assumption of the existence of substantial economies of scale in the industry.

Intra-industry trade is trade in which a country imports and exports the same or similar goods, and may have the same factor proportions in production.

Since World War II, however, a large and generally growing part of world trade has come to consist of exchanges that cannot be attributed so easily to underlying advantages of the countries that export particular goods. Instead, trade seems to reflect arbitrary or temporary advantages resulting from economies of scale or shifting leads in close technological races.⁷

Two kinds of trade in this theory should be recognized: intra-industry trade based on comparative advantage, just as what the traditional trade theory suggests, and intra-industry trade based on economies of scale. The industrial structure of a country's production and the level of intra-industry trade is largely determined by relative factor endowments.⁸ If one country has a comparative advantage and lower costs in its imperfectly competitive industry than the other, then the

⁷Paul R. Krugman, 1986, "Introduction: New Thinking About Trade Policy," in: Paul R. Krugman, ed., Strategic Trade Policy and the New International Economics, the MIT Press, Cambridge, Massachusetts, p. 7.

⁸Paul R. Krugman, 1983, "New Theories of Trade Among Industrial Countries," p. 344.

low cost country will be a net exporter of the output of its imperfectly competitive industry.⁹ Countries with similar factor endowments have fewer differences in their industrial structure, and more intra-industry trade.

Intraindustry trade theory depends on the existence of large economies of scale which means that markets cannot be perfectly competitive. Firms that are able to produce for both domestic and foreign markets will thus have lower costs. High levels of technology, high fixed costs, natural barriers, or even government barriers may lead to an imperfect market structure.

In analyzing these markets, assume the case of oligopolistic competition following the studies of Krugman (1984), Brander and Spencer (1984a, 1984b, 1985), and Dixit (1984). Two firms, domestic and foreign, are assumed to exist in oligopolistic markets. Domestic consumption consists of goods produced by the domestic firm and goods produced by the foreign firm. There exists product differentiation and products may and may not be perfect substitutes. Both firms face declining costs of production and have economies of scale. For simplicity, it is assumed a single product is produced by each firm. Goods are assumed to be sold in segmented markets which means that each firm produces for each

⁹Anthony J. Venables, 1985, "Trade and Trade Policy with Imperfect Competition: The Case of Identical Products and Free Entry." Journal of International Economics 19, p. 11.

market separately and can differentiate prices. Firms produce output to supply the domestic consumption and to export what is left. Finally, it is assumed higher transport costs for the exporting firm. This ensures that the home firm captures a larger share in the domestic market.

The equilibrium of this industry is assumed to be Cournot. Firms are aware that their actions affect the price they receive. They are also aware of their market power and their ability to charge different prices in different markets. Each firm recognizes that its profit depends in part on what its rival does.

Each firm is doing the best it can in terms of maximizing profits given the output of its rival. In Cournot equilibrium, price and output end up somewhere between the monopoly and perfectly competitive outcomes. Firms cannot earn the maximum profit that could be achieved. Thus, for a firm to earn greater profits it should produce more, thus forcing the rival firm to cut back output.¹⁰ Therefore, firms compete in both markets in order to capture a larger share of the market and increase profits.

Firms are assumed to have an equal footing in the marketplace. Therefore, a firm would not take an action without expecting a similar reaction from the other firm. Hence, for a firm to increase its profits, via having a larger

¹⁰J. A. Brander, 1986, "Rationales for Strategic Trade and Industrial Policy," p. 27.

share of the market supply, it has to have lower costs than its rival. If a firm could manage to have lower costs, the two-firm industry would move to a new Cournot equilibrium which involves a higher market share and output for the firm with lower costs, and a smaller share and output for the firm with the higher costs. Increasing the output of the firm through lower costs will force the other firm to find ways to lower its costs or cut back its output as it realizes increased competitiveness. The contraction by the rival increases the price charged since the rival firm would move up its marginal cost curve. These processes would benefit the lower cost firm.¹¹

In a case like this, government intervention is important, either by imposing import tariffs, subsidizing exports, or using other policies to help the home firm to capture a larger share in the market; the government can help to maintain or stand against its rivals and keep its existing market share. Some of these policies and goals will be discussed later.

An example where Intra-Industry trade theory applies is the wide-body jet aircraft industry which comes as close as any industry to being a classic oligopoly.¹² It is generally believed by the industry analysts, the market has "room" for

¹¹Ibid, p. 28

¹²Ibid, p. 31

two actual producers to produce the next generation of planes, though there are three potential producers: Boeing, McDonnell-Douglas, and Airbus.¹³ The large fixed costs and the high technology in the industry generate elements of a natural monopoly.

Historically, this industry seems to enter a game that is repeated whenever a new generation of aircraft comes onto the scene. Three or four potential producers always start each race, with fewer --usually only two-- efficient "winners" in each round.¹⁴ Airbus is a European government cartel, which is supported by European governments, whereas the American producers are supported by military sales.

A successful policy should be taken by each firm and its supporters (e.g. European governments) in order to stay in the market as a "winner" at the end of each round. Here we see the need for government intervention to help the home firm in its race against its rivals.

An argument based on an empirical analysis suggests that intraindustry trade consists predominantly of goods that are not merely differentiated but instead are different in design and application. The results of this study is argued to be

¹³W. H. Branson and A. K. Levorick, 1986, "Strategic Behavior and Trade Policy." in P. R. Krugman, ed., Strategic Trade Policy and the New International Economics, MIT Press, Cambridge, Massachusetts, p. 245.

¹⁴Ibid, p. 245

consistent with intraindustry trade emerging as a way of embracing potential gains from specialization. This study argues that intraindustry trade is consistent with increased international specialization made possible by improved access to national markets. It also argues that intraindustry trade reflects the specialization of trading partners in producing product variants in which each has some special expertise. This study calls for free trade and argues that outside pressures for liberalization will find less and less industry opposition as trade flows increase.¹⁵

It could be argued that the results of that study are not against intraindustry trade and the use of strategic policy since the markets used to analyze intraindustry trade are for goods that are less technology-intensive. Intraindustry trade theory is assumed to be applicable for industries requiring higher technology-intensive goods.

Another empirical study analyzing the Europe-Japan rivalry in the EEC car market supports intraindustry trade and the use of strategic policies. However, it found that a small increase in the present European tariff could be welfare improving and that the export subsidy policy could be the best

¹⁵H. P. Marvel and E. J. Ray, 1987, "Intraindustry Trade: Sources and Effects on Protection," Journal of Political Economy 95, p. 1279.

policy.¹⁶ The results of the study agree with the assumptions and goals of intraindustry trade and strategic policies.

1. Tariff Protection Policy

This section analyzes the use of tariff protection and export subsidy policies undertaken by the government to support the home firm. Tariff protection and export subsidy policies are the most common tools used in such cases.

The argument for tariffs arose originally as a way of raising revenue. Imposing tariffs on imported goods transfers profits from the foreign firm to the government treasury. The only economically justifiable argument for using tariffs as a strategic policy in traditional trade theory is to protect the infant-industry. The idea behind this argument is that any new firm or industry needs a sufficient time to be able to compete with foreign rivals. Hence, temporary protection using tariffs might be justified to protect a domestic industry, since this protection would give this industry a chance to grow, become more efficient, and finally compete with foreign rivals. This argument must rely on the idea of generating positive economies of scale among the firms in the industry or the claim that firms cannot make efficient long run investments through capital markets. If the firms are not

¹⁶D. Laussel, C. Montent, and A. Peguin-Feissolle, 1988, "Optimal Trade Policy Under Oligopoly. A Calibrated Model of the Europe-Japan Rivalry in the EEC Car Market," European Economic Review 32, p. 1564.

protected, they would always have the incentive to go through a period of losses in order to make long-run gains. This is considered to be a weakness of this argument.¹⁷

Recently, some arguments have been raised for using tariffs as a strategic policy. In this report I will look at those arguments related to oligopoly cases and especially to our model. Before discussing these arguments, we must consider the effect of tariffs on the market equilibrium.

Following the assumptions previously discussed, the market would have a Cournot equilibrium as illustrated in Figure 1. In Figure 1, F_d represents the domestic firm's reaction function and F_f the foreign firm's reaction function. Notice that the foreign firm's reaction function is flatter since we assumed higher transport costs paid by the foreign firm. The vertical axis measures the foreign firm's output Y , while the domestic firm's output X is measured on the horizontal axis. The initial Cournot equilibrium will occur at point E, where the domestic firm's reaction function curve intersects with the foreign firm's reaction function curve.

Figure 2 illustrates this equilibrium using marginal cost analysis. The domestic firm's estimated marginal cost is represented by the curve $\mu(\mu^*)$, and the curve $\mu^*(\mu)$ represents the estimated marginal cost of the foreign firm. Domestic

¹⁷J. A. Brander, 1986, "Rationales for Strategic Trade and Industrial Policy." p. 27.

Foreign Firm's
Output

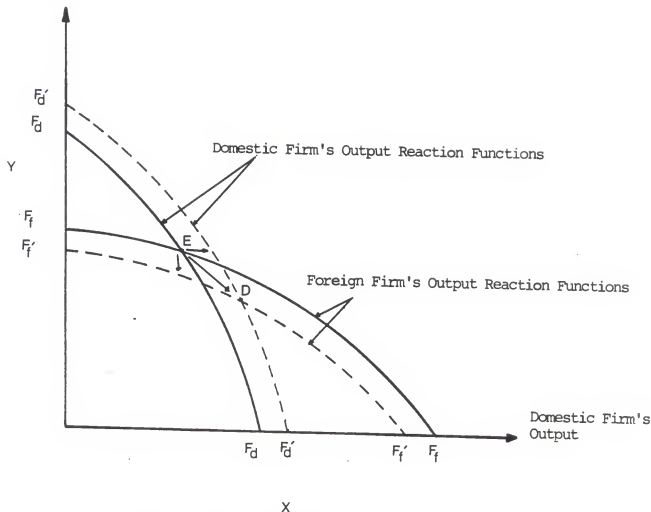


Figure 1. Tariff protection effect on output reaction functions.

Source: Paul R. Krugman, 1984, "Import Protection as Export Promotion: International Competition in the Presence of Oligopoly and Economics of Scale," in: Henryk Kierzkowski, ed., Monopolistic Competition and International Trade, Oxford University Press, Oxford, p. 186.

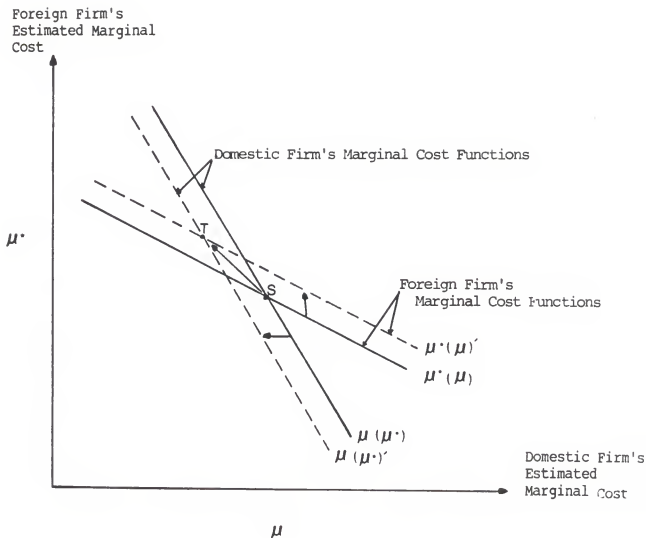


Figure 2. Tariff protection effect on marginal cost

Source: Krugman, 1984, p. 186.

marginal cost is decreasing in foreign, foreign marginal cost is decreasing in domestic marginal cost. If the domestic firm can reduce μ , the domestic firm's output reaction function in Figure 1 will shift out, resulting in an increase in domestic firm's output and a decrease in foreign firm's output. Given that marginal cost functions are decreasing in output, foreign firm's marginal cost μ^* will go up as its output decreases. That is why μ^* is decreasing in μ . Also, in the same way it could be shown that μ is decreasing in μ^* . The market equilibrium occurs where the marginal cost equals the marginal revenue for each firm and this is assumed to be at point S where the schedules $\mu(\mu^*)$ and $\mu^*(\mu)$ cross without any kind of intervention.

Now, we consider a tariff imposed on imported goods. This would shift the curve $\mu^*(\mu)$ right to $\mu^*(\mu)'$, which means a higher cost for every unit produced by the foreign firm. This in turn will lower the domestic firm's marginal costs which is a function of μ^* (the foreign firm's marginal cost), and shift the curve $\mu(\mu^*)$ left to $\mu(\mu^*)'$. Thus, we will have a new equilibrium at point T with a higher marginal cost for the foreign firm and a lower marginal cost for the domestic firm.

Going back to Figure 1, the shift in the marginal cost curve of the foreign firm would shift the firm's reaction function curve in to F_2' . The domestic firm reaction function

would shift out with the new level of marginal cost. The new market equilibrium will occur at point D.

As a result of this mechanism, the share of the foreign firm will be less than before. Less foreign firm output, Y , will be produced. Its marginal and average costs will be higher at the new equilibrium level. On the other hand, the marginal and the average costs of the domestic firm will become lower as its output and share increase due to economies of scale.

1.1 Profit Extraction

In imperfectly competitive markets, firms may earn economic profits if the price charged for goods exceeds the marginal cost. The firm with the larger market share would gain higher economic profits. Hence, it seems to be in the domestic interest to capture some of the foreign firm's rent through protectionism. Protectionism is likely to be an attractive policy from a domestic point of view.

This argument has been raised by Brander and Spencer (1981, 1984). They have developed a model assuming the existence of a domestic firm and a foreign firm supplying the domestic consumption. Both firms initially gain economic profits. Tariffs then could be used as a strategic policy to shift profits from the foreign firm to the domestic firm.

Also it might shift foreign profits to the government treasury and increase government income through tariff revenue.¹⁸

In our model rent-shifting may occur as a result of imposing tariffs on imported goods which means shifting the marginal cost curve of the foreign firm, $\mu^*(\mu)$. This shift in $\mu^*(\mu)$ would increase the price charged by the foreign firm in order to lower its reduced profits and decrease its output since it is incapable of maintaining its share by lowering its costs. The domestic firm now has a chance to increase its output and sales obtaining higher profits as its marginal cost curve, $\mu(\mu^*)$, shifts inward as a result of the shift in the foreign firm's marginal cost curve. The domestic firm reaction function, in turn, would shift out providing higher output and higher profits for the domestic firm. The domestic firm also is able to charge higher prices for its output since the price charged by the foreign firm is higher to increase its profits.

¹⁸J. A. Brander and B. J. Spencer, 1984, "Tariff Protection and Imperfect Competition," in: Henryk Kierzkowski, ed., Monopolistic Competition and International Trade, Oxford University Press, Oxford, p. 199.

1.2 Export Promotion

Export promotion is another recent argument for protectionist policies. This argument has been raised by Krugman (1984), and is related to the infant-industry argument but does not require capital market failures or externalities to apply.¹⁹

No doubt the argument that import protection is export promotion is often a self-serving position of those who would like protection themselves. Still, there is undeniable persuasiveness to the argument. Yet it is an argument which economists schooled in standard trade theory tend to find incomprehensible. In a world of perfect competition and constant returns to scale, protecting a product can never cause it to be exported. It may cause some other good which is complementary in production to be exported - but this is hardly what the businessmen seem to have in mind.²⁰

Krugman's model, which he has developed to analyze his argument, is based on similar assumptions to the assumptions we have assumed previously. The assumptions of a domestic and a foreign firm producing a single product that is not a perfect substitute. Both firms compete in segmented markets and face transport costs. Finally, the important element in Krugman's analysis is the existence of economies of scale and declining marginal costs.

¹⁹J. A. Brander, 1986, "Rationales for Strategic Trade and Industrial Policy." p. 32.

²⁰P. R. Krugman, 1984, "Import Protection as Export Promotion: International Competition in the Presence of Oligopoly and Economics of Scale," in: Henryk Kierzkowski, ed., Monopolistic Competition and International Trade, Oxford University Press, Oxford, p. 180.

The idea behind this argument is that restricting a particular market, or subset of a market, to certain firms, helps those firms in other markets. "By giving a domestic firm a privileged position in some one market, a country gives it an advantage in scale over foreign rivals. This scale advantage translates into lower marginal costs and higher market share even in unprotected markets."²¹

To illustrate this, suppose that the home government imposes tariffs on imported goods to exclude the foreign firm at least from some part of the domestic market. This action would increase the domestic firm's output and reduce the rival output in the protected market. Holding μ , home firm's estimate of marginal cost constant, the increase in μ^* , the foreign firm's estimate of marginal cost would shift $\mu(\mu^*)$ left and lower the estimated marginal cost which in turn would cause $\mu^*(\mu)$ to shift up. That is, for a given level of foreign marginal costs, domestic costs fall; for a given level of domestic marginal costs, foreign costs rise. The change in the domestic firm's marginal cost causes $F_d F_d$ to shift out and X to increase. On the other hand, $F_f F_f$ shifts in and Y falls due to the change in the foreign firm's marginal cost. These changes would lead to lower marginal costs for the domestic firm and a larger share in all markets. Protecting

²¹Ibid, p. 245

the domestic firm in the domestic market increases domestic sales and lowers foreign sales in all markets.²²

2. Export Subsidies Policy

The analysis of export subsidies is similar to the analysis of import tariffs. Using the previous assumptions we could trace out the effects of export subsidies paid by the home government to increase the pie share of the domestic firm in the world market and extract profits from the foreign firm.

Starting out from a Cournot equilibrium dominating the industry, we would explain the strategic use of export subsidy policy using marginal cost curves and the reaction function curves. Remember that the only way for a firm to capture a larger share of the market in a Cournot equilibrium is to have lower costs than its rivals. For a firm to increase its output, its rival's output must decrease. Therefore, a firm cannot increase its output without a credible decrease in its costs. At the equilibrium point, neither firm can decrease its costs by itself. Hence, government actions in setting a subsidy make it credible for a domestic firm to have lower costs since subsidies have the same effect as lower costs.

A subsidy to the cost of producing extra output makes it in the firm's interest to expand output, even taking the other firm's output as given. Therefore, the firm's expansion of output is credible. The rival firm can best respond by contracting output. In effect the subsidy makes it possible for the domestic firm to stake out a larger market share

²²Ibid, p. 187.

of a profitable international market than it otherwise could.²³

Figures 3 and 4 illustrate the effects of subsidies on our equilibrium model. Suppose the home government sets a per unit subsidy for a produced good. This subsidy shifts the home firm's marginal cost, $\mu(\mu^*)$, left generating lower costs at every level of production. This shift in $\mu(\mu^*)$ has a two-way effect: On one hand, it shifts the home firm reaction function out representing the expansion in the domestic firm's output. On the other hand, it affects the foreign firm's function through shifting the foreign firm's marginal cost curve, $\mu^*(\mu)$, which in turn shifts in the foreign firm reaction function representing the counteraction in the output level of the foreign firm.

As a result of this subsidy the market equilibrium will move from point E to point D with a higher level of output for the domestic firm X, and lower Y, the foreign firm output level. At the new equilibrium level the domestic firm will have a lower marginal cost and the foreign firm will have a higher marginal cost. The domestic firm gains higher profits with the subsidy in this case while the foreign firm gains less profits than the original situation without subsidy. In this case the subsidy shifts rent from the foreign firm to the domestic firm.

²³J. A. Brander, 1986, "Rationales for Strategic Trade and Industrial Policy." p. 29.

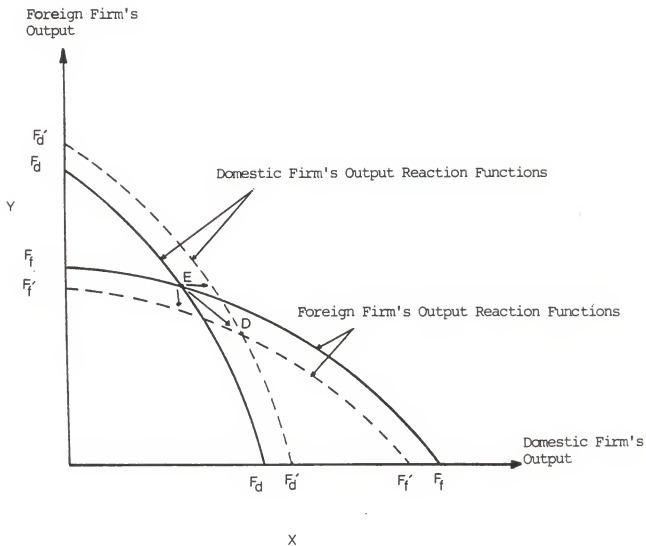


Figure 3. Export subsidies effect on output reaction functions

Source: Krugman, 1984, p. 183.

Foreign Firm's
Estimated Marginal
Cost

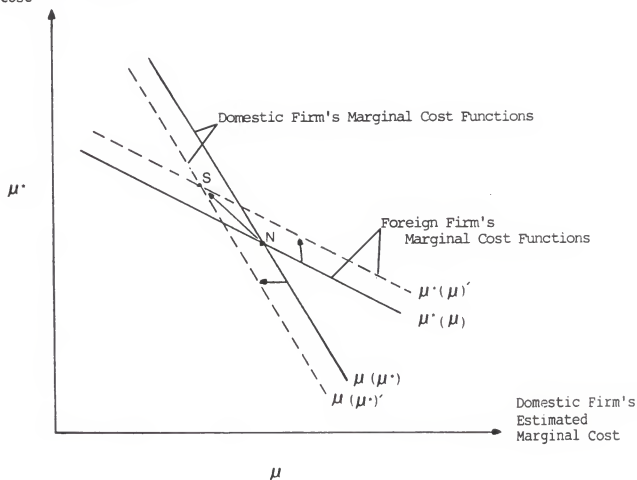


Figure 4. Export subsidies effects on marginal costs

Source: Krugman, 1984, p. 186.

The main goal for subsidies is to shift rent from foreign rivals, but the domestic firm also gains from subsidies which is a transfer from taxpayers to shareholders of the firm via the domestic treasury. In fact, because of "strategic" effect, rent-shifting profits to the domestic firm rise by more than the amount of the subsidy.²⁴

This argument has been raised by James Brander and Barbara Spencer (1985) and their findings have received much attention from academic researchers and policy analysts because it seems to provide theoretical support for a targeted industrial policy.²⁵

Brander and Spencer argue that subsidies do not only increase domestic profit and reduce foreign profit, but also lower the world price of the goods and at the same time it actually increases domestic welfare net of the subsidy.²⁶

Export subsidies may help the domestic firm to move from a Cournot equilibrium to a Stackelberg output leader as pointed out by David de Meza.²⁷ The government could commit

²⁴Ibid, p. 29.

²⁵Gene M. Grossman, 1986, "Strategic Export Promotion: A Critique." in: P. R. Krugman, ed., Strategic Trade Policy and the New International Economics, MIT Press, Cambridge, Massachusetts, p. 48.

²⁶J. A. Brander and B. J. Spencer, 1985, "Export Subsidies and International Market Share Rivalry,": Journal of International Economics 18, p. 87.

²⁷Dave de Meza, 1986, "Export Subsidies and High Productivity: Cause or Effect?" Canadian Journal of Economics, p. 348.

itself to paying an export subsidy before output level is chosen. Also, he argues that the countries with the lowest cost would set the highest subsidies. That is, at the Cournot equilibrium each firm maximizes profit given the level of its rival's output, and when a firm expands from the Cournot equilibrium, part of its increased sales will be matched by a reduction in the output of its rival. Hence, the subsidized firm will have higher profits due to the fraction of increased output that is transferred from its rival. The lower a firm's marginal cost, the higher profits it gains from selling more at the initial price. In this way the low-cost country has the most incentive to encourage its home firm to expand and therefore pays the highest subsidy.²⁸

The export subsidy is higher given the smaller the number of domestic firms.²⁹ A larger number of domestic firms or freedom of entry makes it less likely that an export subsidy yields gains. That is, the potential profits yielded by an export subsidy will tend to be dissipated by the new entry or increased domestic competition.³⁰

Notice that the tariff policy and the subsidy policy have the same or similar effects in capturing larger shares in the

²⁸Ibid., p. 349.

²⁹A. K. Dixit, 1984, "International Trade Policy for Oligopolistic Industries." p. 12.

³⁰D. Collie and D. de Meza, 1986. "Inadequacies of the Strategic Rationale of Export Subsidies," Economic Letters 22, p. 372.

market and gaining higher profits by the domestic firm as can be recognized from the previous figures. But in fact, there are some differences in the results of using tariffs or subsidies. Tariffs affect the foreign firm's marginal cost and output reaction functions first, which in turn affect the domestic firm's marginal cost and output reaction functions. Subsidies lower the domestic firm's marginal cost and affect the domestic firm's marginal cost and output reaction functions before affecting the foreign firm's marginal cost and output reaction functions.

Tariff increases the government revenue and the domestic firm's profits. On the other hand, it increases the world price of the goods and lowers the world welfare. Prices will be higher in all markets and the quantity demanded will be less as the prices increase. It also reduces the domestic consumption. Hence, domestic as well as foreign welfare is lowered by the tariffs.³¹

Subsidies differ from tariffs in that it lowers the world price of the goods and increases the world welfare. Even though subsidy is a transfer from taxpayers to the firm's shareholders, it increases domestic welfare net of the subsidy.³²

³¹J. Brander and B. Spencer, 1984, "Tariff Protection and Imperfect Competition," p. 200.

³²J. Brander and B. Spencer, 1985, "Export Subsidies and International Market Share Rivalry," pp. 87-88.

III. THE THEORY OF TECHNOLOGICAL COMPETITION

Another important theory that has been developed to analyze today's trade among industrial countries is the theory of technological competition. This theory, however, suggests that in some manufacturing sectors there may be a strong temptation for countries to engage in protectionist or interventionist policies.³³

Technological competition theory differs from the previous theory, intra-industry theory, in that it does not depend on the assumption of decreasing marginal costs or economies of scale. The basic concept of this theory is that firms try to lower their costs through expenditures on R&D. Firms can compete technologically, investing in R&D to lower their costs, develop new products, or both. Firms or countries with better technology have lower costs.

International trade therefore has the effect of magnifying welfare differences associated with differences in technology, and insuring that the gains from trade are proportionately greater for the country with superior technology. The reason for this is essentially that, with trade, firms in the country with superior technology can expand at the expense of foreign firms, so moving down and along their average cost curves, and forcing foreign firms back and up their average cost curves.³⁴

³³P. R. Krugman, 1983, "New Theories of Trade Among Industrial Countries," p. 345.

³⁴A. J. Venables, 1985, "Trade and Trade Policy with Imperfect Competition: The Case of Identical Products and Free Entry," p. 11.

Firms in the industry under consideration try to compete and be more efficient in production. Each firm invests in R&D in order to discover more efficient methods to exploit raw materials and have lower costs. Higher technology means lower costs and higher output. A firm captures a larger share of the market if it succeeds in achieving lower costs than its rivals.

The firm profit in this case is revenue minus production costs, transport costs, and expenditures in R&D. In the home market, the foreign firm incurs higher transport costs than the domestic firm.

"A proper theory of technical progress in oligopoly must be dynamic, considering how market conditions affect and in turn are affected by the research and development activities of the firms."³⁵ Recently, several studies have attempted to come up with models that best fit the theory of technological competition, for example, Spencer and Brander (1983), Dixit and Stern (1982), Venables (1985), and Krugman (1983 and 1984).

In this section, following the steps of Krugman, we discuss a model similar to the one in the previous section assuming the existence of a domestic and a foreign firm competing in several markets including each firm's home

³⁵A. K. Dixit and N. Stern, 1982. "Oligopoly and Welfare: A Unified Presentation with Applications to Trade and Development," European Economic Review 19, p. 135.

market. Marginal costs in this section are assumed to be constant. The marginal cost of production is independent of the level of output, that is no economies of scale exist, but is decreasing in the amount of investment in R&D by the firm. The higher the investment in cost-reducing R&D by the firm the lower its marginal costs. Each firm takes the other firm's output and level of technology as given. Finally, it will be shown that investment in R&D has an effect on profits which is proportional to expected sales, that is, firms have increasing returns.

This analysis will start with the assumption that the two firms are at a Cournot equilibrium, as illustrated in Figure 5 at point E and Figure 6 at point M. The equilibrium is based on each firm's level of investment in R&D and level of output given the other firm's level of investment in R&D and level of output. Figure 5 illustrates the equilibrium in terms of investment in R&D. In Figure 5, $N(N^*)$ is the R&D reaction function of the domestic firm and $N^*(N)$ is the R&D reaction function of the foreign firm. Each firm's optimal investment in R&D is declining in the other's investment. N represents the level of the domestic firm's investment in R&D, while N^* represents the foreign firm's level of investment in R&D. It is assumed that the higher the level of investment in R&D, the lower will be marginal production costs, and thus, the higher will be output. On the other hand, the larger the

Foreign Investment
in R&D

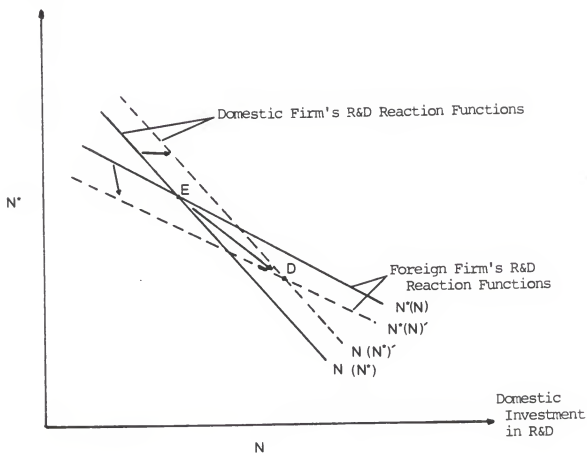


Figure 5. Effect of R&D subsidies on R&D reaction functions

Source: Krugman, 1984, p. 189.

output the greater the marginal profitability of R&D, so the level of investment is increasing in output.

Figure 6 illustrates the equilibrium in terms of output. The industry will initially be at equilibrium at point M, where the two reaction functions cross. This represents the market share of each firm holding the level of technology constant. Output and market share depend on marginal costs which depend on the amount of investment in R&D. An increase in cost-reducing R&D by the home firm will then lower its marginal cost, shift its reaction function outward and increase its output and market share.³⁶

Suppose, however, that the domestic firm increase its investment in R&D through R&D subsidies paid by the home government or through import protection which would lower the expected marginal cost. This policy change would shift $N(N^*)$ outward having a two-way effect, the shift in $N(N^*)$ will shift the domestic firms reaction function outward. And, on the other hand, will shift the foreign firm's R&D reaction function, $N^*(N)$, which is decreasing in the home firm's investment in R&D. The shift in $N^*(N)$, in turn, will shift the foreign firm's output reaction function leftward. As a result the market equilibrium will move from point M to point N yielding higher output for the domestic firm and lower

³⁶P. R. Krugman, 1984, "Import Protection as Export Promotion" International Competition in the Presence of Oligopoly and Economies of Scale," p. 187.

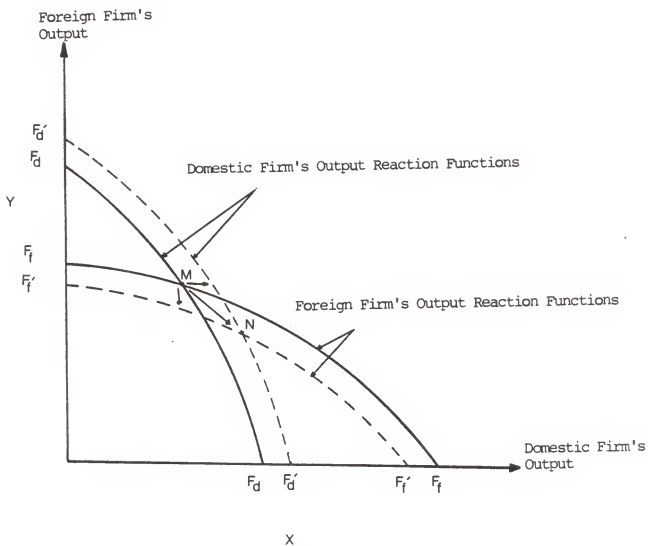


Figure 6. Effect of R&D subsidies on output reaction functions

Source: B. J. Spencer and J. A. Brander, 1983, "International R&D Rivalry and Industrial Strategy," Review of Economic Studies, 50, p. 709.

output for the foreign firm and shifting profits from the foreign firm to the domestic firm.

The expected return to a marginal dollar of R&D by the domestic firm will raise as the firm's output increases, and lower the expected return to a marginal dollar of R&D by the foreign firm with lower output. Domestic R&D will be greater than it would otherwise have been as a result of the shift in the R&D reaction functions in the directions indicated by the dotted lines in Figure 5; foreign R&D will be less. Because the domestic firm's relative technological position is improved, it may well increase its share in all markets.³⁷

Therefore, firms compete in achieving a superior technological position and are more efficient in employing technology. Hence, firms and countries compete in R&D, and have more incentives to increase investment in R&D.

Findings by Grossman and Shapiro (1987) further suggest that at a Cournot equilibrium the firm that is ahead in technology and has lower costs has a greater incentive than its rival to engage in cost-reducing R&D.³⁸

1. R&D Subsidies Policy

The first policy of industrial strategy to be considered in the case of technological competition is R&D

³⁷Barbara J. Spencer and J. A. Brander, 1983, "International R&D Rivalry and Industrial Strategy," Review of Economic Studies 50, p. 709.

³⁸Gene Grossman and Carl Shapiro, 1987, "Dynamic R&D competition," The Economic Journal 97, (June), p. 385.

subsidies. Without government intervention, firms are at a Cournot equilibrium. Given each firm's own level of technology and output based on its resources and given its rival's level of technology and output, a firm cannot increase its own investment in R&D by itself.

A domestic R&D subsidy makes it credible for the home firm to increase its investment in R&D. The subsidy shifts out the domestic firm's R&D reaction function which in turn shifts in the R&D reaction function of the foreign firm, increasing the domestic firm's R&D equilibrium and reducing the R&D undertaken by the foreign firm.³⁹

Using the Cournot model, the output reaction function of the domestic firm shifts out with R&D subsidies due to the shift in the R&D reaction function of the domestic firm, $N(N^*)$. The foreign firm's output shifts in providing a new equilibrium with higher output level for the domestic firm and a lower output level for the foreign firm. R&D subsidies increase the domestic firm profits and extract rent from the foreign firm to the domestic firm as domestic output increases and foreign output decreases.

The optimal R&D subsidy, as it has been argued by Spencer & Brander (1983), maximizes domestic rent by shifting the R&D reaction function of the domestic firm to a point where it would have been the Stackelberg leader-follower point in R&D

³⁹P. R. Krugman, 1983, "New Theories of Trade Among Industrial Countries," p. 340.

space with no subsidy and without disturbing the Cournot equilibrium behavior of the firm.⁴⁰

This policy is more appropriate if there are no spillovers of R&D, that is the domestic firm is able to appropriate fully the return from R&D.⁴¹

2. Transfer of Foreign Technology Policy

In the case when there are spillover effects of R&D or transfer of technology to other firms which make the innovating firm incapable of capturing the full return from R&D, the other firm may still do well even if it is not first in innovating a product, but is in a position to copy and improve on major innovations being made by its rival.

In oligopolistic rivalry between a domestic firm and a foreign firm, the rents earned by the domestic firm are most likely to be reduced by any spillover of the domestic R&D to the foreign firm. Hence, domestic benefits from R&D investments and subsidies could be lowered as a result of spillovers. This means that the domestic firm and industry will be better off if it is in a position to take maximum advantage of spillover of R&D from the foreign firm.⁴²

⁴⁰B. J. Spencer and J. A. Brander, 1983, "International R&D Rivalry and Industrial Strategy," p. 712.

⁴¹Ibid, p. 713.

⁴²B. J. Spencer, 1986, "What Should Trade Policy Target?" in: P. R. Krugman, ed., Strategic Trade Policy and the New International Economics, MIT Press, Cambridge, Massachusetts, p. 78.

Policies that could speed up the transfer of foreign technology to the domestic industry seem to be appropriate to use. This could be more beneficial to the domestic industry and the domestic country will be better off if the government aids the transfer of foreign technology. This policy has been undertaken by the Japanese as a function of their industrial development policies. For example, the Japanese semiconductor industry has benefitted substantially from the U.S. R&D in semiconductors. By the early 1980's Japan had become a major competitor in world markets, achieving significant gains in global market share, largely at the expense of the U.S. industry.⁴³

⁴³M. Borrus, L. D. Tyson, and J. Zysman, 1986. "Creating Advantage: How Government Policies Shape International Trade in the Semiconductor Industry," in: P. R. Krugman, ed., Strategic Trade Policy and the New International Economics, MIT Press, Cambridge, Massachusetts, p. 91.

IV. GOVERNMENT-GOVERNMENT INTERACTION AND RETALIATION

So far, this analysis has been based on the assumption that there is no interaction or retaliation among governments. Government decisions in choosing a policy to benefit its home industry are made taking those of the other governments as fixed. In reality the policy choices of any government interact with other government choices in many ways. It is clear that other governments cannot be expected to let one government get away with such policies and stand by with no reaction. Therefore, any one country, when evaluating its policy choices, must be mindful of the expected reactions or retaliations from other countries.⁴⁴ Governments involved in trade competition among industries see the world in more or less the same way, and each government is assumed to target maximizing its national welfare, and is assumed to recognize the strategic possibilities present in the formation of international trade policy.⁴⁵

There is no generally accepted theory of policy interaction. One theory that is used to study the interaction between two governments is a strategic structure known as the "prisoner's dilemma". The basic idea of the "prisoner's

⁴⁴A. K. Dixit, 1986, "Trade Policy: An Agenda for Research," in: P. R. Krugman, ed., Strategic Trade Policy and the New International Economics. MIT Press, Cambridge, Massachusetts, p. 298.

⁴⁵J. A. Brander, 1986, "Rationales for Strategic Trade and Industrial Policy," p. 36.

dilemma" is that it generates three possible outcomes. The first outcome is that there is no profit shifting if the two governments cooperate and do not use any policies. The second outcome comes about if one country refrains from an active trade policy while the other actively protects imports or promotes subsidies. In this case the latter one would gain from strategic policies and the first one would lose from being passive. The third outcome is the result of actively using strategic policies by both governments. In this situation, both countries will have less profits than the first outcome; that is, both countries will lose because of intervention, but both countries would lose less than the country who refrains from active trade policy in the second outcome.⁴⁶

Brander argues that in the problem of choosing the subsidy level, the government should subsidize the firm.

It really does not matter whether the other country has a strategic subsidy or not; the best response for either country is to use a subsidy also. However, the actual benefit of a subsidy is much higher if the other country does not use a subsidy too. Both producing countries would be better off if neither used the subsidy, but the unilateral incentive to use the subsidy is clear.⁴⁷

Countries cannot cooperate to use an optimal policy because there is a high incentive for governments to "cheat"

⁴⁶J. D. Richardson, 1986, "The New Political Economy of Trade Policy," in: P. R. Krugman, ed., Strategic Trade Policy and the New International Economics, MIT Press, Cambridge, Massachusetts, p. 271.

⁴⁷J. A. Brander, 1986, "Rationales for Strategic Trade and Industrial Policy," p. 38.

and gain much higher profits, at least in the short run. Countries cannot be forced not to cheat and to abide by treaties they sign.

Therefore, there should be a strategy that could be used to insure the cooperative outcome. One approach is called "tit for tat"; this states that the government should cooperate if the rival had cooperated the last time and defect if the rival had defected the last time. Another strategy is the "trigger strategy", which is to cooperate as long as the rival is cooperating, and to play the noncooperative move forever when the rival defects. These approaches are limited by several factors. First, the world is not a laboratory in which experiments can be repeated. Second, it is very hard to disentangle the effects that contribute to real policy outcomes.⁴⁸

⁴⁸Ibid, p. 39.

V. POLICY IMPLICATIONS AND CONCLUDING REMARKS

Recent studies in international trade have started to apply some theories from oligopolistic competition to the analysis of trade among industrial countries. This has occurred because the standard trade theory which relies on the assumptions of perfect competition does not always fully describe today's trade with the increase in trade among countries with similar economies.

This report has discussed two theories. The first theory is the theory of intra-industry trade which depends on the existence of economies of scale. Firms compete in several international markets to capture a larger share, hence, benefit from having economies of scale to lower costs and gain higher profits. Import protection policy may help the domestic firm in capturing a larger share in the industry. The problem with protectionism is that it lowers the welfare of domestic consumers and the world welfare too. This policy if matched by the foreign countries may harm both firms too. Export subsidies policy also is a good policy to shift foreign rent if there is no retaliation. An export subsidies policy increases domestic welfare and lowers prices and is recommended even with retaliation to minimize rent shifting from domestic to foreign firms. The problem with import protection and export subsidies policies is that these policies violate international trade agreements such as GATT.

The second theory is the technological competition theory. Firms try to capture a larger share through investments in R&D to lower their cost. Firms with superior technology gain higher profits by capturing a larger share in the industry. Subsidizing R&D is one of the policies that can be used to increase a domestic firms' profits. One argument against subsidization is that R&D may have some kind of spillover which may benefit the rival firm. Hence, it might be more beneficial to the domestic firm to use the second policy of aiding the transfer of foreign technology. Transferring and modifying foreign technology may enable the domestic firm to catch and take the lead in the industry.

The policy of R&D subsidies seems to be a good policy to use even with the existence of spillover. That is, it increases the world and domestic welfare, and with a combination of some policies to minimize spillovers to the foreign firm it may increase the share of the domestic firm in the industry. Also, there is no conflict between this policy and international trade agreements.

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IMPERFECT MARKET STRUCTURE
AND
INTERNATIONAL TRADE

by

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AN ABSTRACT OF A REPORT

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Forms of oligopoly and imperfect competition seem to characterize the nature of international trade among industrial countries, which has long been assumed to be a form of perfect competition in the traditional trade theory. Recent developments in this area have applied some theories of other fields of economics like industrial organization into international trade.

In this report two theories have been considered to explain some characteristics of today's trade where volume has increased among countries with similar economies. The first theory is the theory of intra-industry trade which depends on the existence of economies of scale. Firms have lower marginal costs as they increase their output. The industry is assumed to be at a Cournot equilibrium. Firms gain higher profits by capturing a larger share in the market and shifting profits from the foreign rivals.

Theory of technological competition is the second theory which assumes that firms compete in employing higher and more advanced technology through investment in R&D which enables them to have lower costs. The firm with superior technology and larger investment in R&D has lower costs and a larger share in the market. R&D subsidies and transfer of foreign technology are two policies associated with this theory to help the domestic firm in achieving a superior technology, hence, gaining higher profits at the expense of foreign rivals.